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Eoterfezia (as a simple form), Terfezia, Tirmania, Terfeziopsis, Picoa (incl. Phaeangium), Delastria, Delastreopsis (as higher differentiated forms). Genabea, Choiromyces, and perhaps also Hydnobolites and Pseudobalsamia are excluded from the Plectascineae, and probably go to the Eutuberineae series.

2. The *Balsamiaceae*, with asci in definite hymenia lining the walls of chambers closed to the outside, includes the single genus Balsamia. Hydnocystis and Geopora go to the Pezizaceae. (See ED. FISCHER, Hedw. **30**:56–60. 1898.)

3. The *Eutuberineae series*, with hymenia lining the walls of interior passages which open to the outside and are either hollow or more or less filled with hyphal wefts (asci rarely withdrawn from hymenia into the trama), includes the gymnocarpic forms and are probably derived from the simpler Helvellales like Rhizina and Sphaerosoma.

Since the second series is represented by the single genus Balsamia, with a hymenium lining interior passages of the fruit body, one is led to inquire if it would not be a more satisfactory arrangement to recognize two series: (1) the Plectascales as outlined above, and (2) the Tuberales, including the Eutuberineae and Balsamia. May it not be possible that Balsamia has been derived from some of the Eutuberineae by a secondary modification of such a nature that the interior passages have become closed from the outside; just as in Geopora, as FISCHER points out, examples occur in which such a secondary modification has probably taken place? The development of Balsamia should be studied with this in view.

Among the basidiomycetous Hypogeae several collections of Hysterangium furnish additional evidence of the existence of a *Hysterangium-Clathraceae series* beginning with Gautieria, and then passing from Hysterangium through Phallogaster, Protubera, etc., to the Clathraceae.

The paper abounds in speculative discussion as to relationship and ontogeny, which is a characteristic of FISCHER'S contributions. In a number of instances his views seem to be based on rather insufficient evidence, which is perhaps the chief adverse criticism which may be made on this contribution. Some of them appear to be well founded, and certainly his present views on the classification of the ascomycetous Hypogeae are to me much more satisfactory than his arrangement in ENGLER & PRANTL'S *Pflanzenfamilien*. It should be said, however, that all his suggestions and speculations are stimulating to thought, and I trust will also stimulate collectors and investigators to bring to the light the riches in subterranean fungi which are awaiting us in this large field of North America.—GEO. F. ATKINSON.

Cytological basis of Mendelism.—GRÉGOIRE[6] has published a critical discussion of current cytological theories, with particular reference to their bearing on the interpretation of Mendelian phenomena. Certain fundamental hypotheses will be mentioned first. His view of the individuality of the chromosomes is based quite largely on his well-known observations, and those of his pupils, on the resting stage of the nucleus compared with the late telophase and early anaphases of mitosis. The attempts of FICK,[7] TELLYESNICZKY,[8] and others to disprove individuality, come in for pointed criticism. GRÉGOIRE concludes that "Il est certain que les chromosomes persistent dans leur individualité, sous la forme de continus structuraux, à travers toute l'ontogénèse." Regarding reduction, he considers it certain that the heterotypic mitosis dissociates the n chromosomes, received by the reproductive mother cells, into two groups of $n/2$; and probable that a paternal chromosome always conjugates with a maternal of the same form. But he finds nothing to *prove* that a pair of allelomorphic characters is fixed only in one pair of chromosomes, nor that the chromosomes conjugated in the heterotypic gemini are homologous maternal and paternal chromosomes.

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[6] GRÉGOIRE, V., Les fondements cytologiques des théories courantes sur l'hérédité Mendélienne. Ann. Soc. Roy. Zool. et Malacol. Belgique **42**:267–320. *figs. 4.* 1907.

The hypotheses necessary to explain Mendelism on a cytological basis are given as follows: (1) The chromosomes play a preponderant rôle in the transmission and determination of hereditary characters. (2) The different chromosomes of a given cell are bearers of different properties. (3) In the chromosomes of a hybrid egg a Mendelizing character is represented only by two chromosomes, one maternal, one paternal. In one of these the character is represented in a recessive condition (modalité recessive), in the other in the dominant condition.

It must be said (and GRÉGOIRE would probably agree with this) that the conception of representative particles in the dominant and recessive condition merely projects the phenomena of dominance back into the germ cell without attempting an analysis of its meaning, or how it comes about, and hence explains nothing. This appears to the reviewer to be a serious and probably fatal objection to the last hypothesis.

On the basis of these hypotheses the germ cells would receive of each pair a single recessive chromosome (maternal or paternal) and a single dominant chromosome (maternal or paternal). In the prophase of the heterotypic mitosis the chromosomes join in pairs, and observation favors the view that these are homologous maternal and paternal chromosomes. Then after reduction half the germ cells would receive a "dominant" chromosome, and half the corresponding "recessive" chromosome. We thus arrive at MENDEL's conception, and the chances of meeting he described between germ cells are here conceived between chromosomes. Granting the three hypotheses then, Mendelian phenomena would be expected to result.

In Pisum eleven or more pairs of allelomorphs have been observed and the reduced number of chromosomes is only seven; which shows that in this case, at least, several characters must reside in one chromosome. The characters must then be confined to separate particles or corpuscles of the chromosomes, and an interchange of homologous particles according to chance during maturation would give the Mendelian combinations. Many observers, including STRASBURGER, ROSENBERG, ALLEN, and SCHREINER, have described such an interchange of particles; but GRÉGOIRE's conclusion, which he has emphasized before, is that nothing in the observations of the nuclear reticulum, the somatic spirem, or the heterotypic spirem justifies the admission of representative particles, chromatic or achromatic. The "chromomeres" observed particularly in the heterotypic spirem, he considers not as autonomous granules imbedded in a substratum, but merely as a substratum impregnated with chromatic material and rather regularly alveolated, giving the appearance of a single or double row of "chromomeres."

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[7] FICK, Betrachtungen über die Chromosomen, ihr Individualität, Reduktion und Vererbung. His-Waldeyer's Archiv. 1906; Vererbungsfragen, Reduktions- und Chromosomenhypothesen, Bastard-Regeln. Engeb. Anat. Ent. 1907.

[8] TELLYESNICZKY, Zur Kritik der Kernstrukturen. Archiv. Mikr. Anat. **60:** 681–706. 1902; Ruhekern und Mitose. *Idem* **66:**367–433. 1905.

GRÉGOIRE further denies that there is an interchange of particles between the parallel filaments in the double spirem stage, such as various cytologists have described. These two facts, namely, the presence of autonomous particles and their free interchange at some time during the reduction processes, would appear to be essential to a cytological basis for Mendelian phenomena.—R. R. GATES.

Extra-floral nectaries and "myrmecophily."—To many who have held the untenable view that plant structures are necessarily useful, extra-floral nectaries have been a stumbling-block. NIEUWENHUIS-UEXKÜLL[9] has made an exhaustive study of the extra-floral nectaries of 100 species of plants growing at Buitenzorg, and it may be said that these studies are of great importance because they show conclusively that we know nothing concerning the advantage of these peculiar organs. There is an admirable critical review of the treatises that consider extra-floral nectaries, beginning with HALL's study in 1762. The term extra-floral nectary was first employed by CASPARY in 1848, who rather inclined toward LIEBIG's theory that they are of value to plants as a means of excreting sugar when present in excess. The classic study of these organs is DELPINO's treatise issued in 1874, in which the term extra-nuptial nectaries is employed, and the idea advanced that the sugar they secrete attracts ants; these insects in turn are supposed to defend such plants against their enemies. Simultaneously with DELPINO, BELT proposed a similar theory for *Acacia sphaerocephala*, and from then until very recently botanists have generally believed in the existence of myrmecophiles, or ant-loving plants. Among the supporters of myrmecophily have been DARWIN, FRITZ MÜLLER, TRELEASE, and SCHIMPER. BONNIER (1878) regarded all nectaries as sugar reservoirs, any other function being thought quite incidental, and KERNER (1878) regarded extra-floral nectaries as protective against "unbidden guests." Beginning with the skeptical attitude taken toward myrmecophily by VON IHERING in 1894, there have been critical contributions by

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[9] NIEUWENHUIS VON UEXKÜLL-GÜLDENBANDT, M., Extraflorale Zuckerausscheidungen und Ameisenschutz. Ann. Jard. Bot. Buit. II. **6**:195–327. 1907.